

Open Data Lab Annual Report - 2018

The Open Data Lab Collaboration

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The Team



Pete Alonzi came to data science by way of the particle physics community. As a result he has great interest in making data open and usable to broad audiences. He serves as a data scientist at the DSI and is the project manager for the Open Data Lab.



Phil Bourne ”At vero eos et accusamus et iusto odio dignissimos ducimus qui blanditiis praesentium voluptatum deleniti atque corrupti quos dolores et quas molestias excuri sint occaecati cupiditate non provident,At vero eos et accusamus et dent, ”



Tim Clark ”At vero eos et accusamus et iusto odio dignissimos ducimus qui blanditiis praesentium voluptatum deleniti atque corrupti quos dolores et quas molestias excuri sint occaecati cupiditate non provident,At vero eos et accusamus et dent, ”



Daniel Mietchen ”At vero eos et accusamus et iusto odio dignissimos ducimus qui blanditiis praesentium voluptatum deleniti atque corrupti quos dolores et quas molestias excuri sint occaecati cupiditate non provident,At vero eos et accusamus et dent, ”



Lane Rasberry ”At vero eos et accusamus et iusto odio dignissimos ducimus qui blanditiis praesentium voluptatum deleniti atque corrupti quos dolores et quas molestias excuri sint occaecati cupiditate non provident,At vero eos et accusamus et dent, ”

Letter from the editor

hello world

Contents

1	Overview	5
1.1	What is the Open Data Lab?	5
1.2	User Archetypes	6
1.3	User Summary	7
1.4	A phased approach	8
1.5	What's next for the Open Data Lab?	8
2	Key Developments	9
2.1	Phase 1 - Closed β	9
2.2	Establishment of User base	9
2.3	Technology exploration	9
2.3.1	Amazon Web Services	9
2.3.2	Local UVA - Rivanna and Ivy	10
2.3.3	Github	10
2.3.4	Dataverse	10
2.3.5	Spark	10
2.3.6	SPARQL Endpoint	10
3	Datasets	11
3.1	Healthy Markets	11
3.2	Numismatic	11
4	Research	12
4.1	Bourne/Mura Capstone	12
4.2	DSI Wiki	12
5	Education	13
5.1	Spark Workshop	13

5.2	GitHub Workshop	14
5.3	Using GitHub as a Teaching Medium	15
5.4	Plans for 2019	16
6	Vital Metrics	17
6.1	AWS usage	17
6.2	FTE analysis	17
6.3	Budget	17
6.3.1	Funding	17

Chapter 1

Overview

1.1 What is the Open Data Lab?

OPEN

We encourage all users to be as open as possible with every aspect of their work. That may be in opening up their data sets, publication, source code, or ...

DATA

We take an expansive definition of data. Everything from traditional data, to code, to workflows, to published material, and so on is considered data to us. We provide a place for all things digital data.

LAB

We provide a place where the power of contemporary computing can be brought to bear against data resources. Given the scale of data today this means colocating the data and computational resources.

Open Data Lab

The Open Data Lab is a resource to provide state of the art computing and data infrastructure to researchers, students, and sharers. It is guided by the principles of science and openness.

1.2 User Archetypes

There are many potential use cases for the Open Data Lab. In this section we describe the three cases that have been tested so far. They are: the Collaborator, someone who is working on a research project; the Student, someone who is using the Open Data Lab to learn about data science; and the Sharer, a person with data who wants to open it up to a broader audience.

The Collaborator

This archetypal person uses the Open Data Lab to conduct research. They access data and computational resources that are colocated. This colocation facilitates lower latency and increased performance. A wide range of services can be provided globally by AWS and locally through UVA HPC resources. Sample workflow:

1. Request a user account on the Open Data Lab
2. Once per collaboration:
 - (a) Load data
 - (b) Provision computational resources
3. Conduct research operations
4. Register resulting products in Dataverse

The Student

This archetype uses the Open Data Lab to facilitate learning. An example would be someone who participates in a workshop where an ODL notebook instance powered by AWS SageMaker provides the working environment. Sample workflow:

1. Request a user account on the Open Data Lab
2. Logon to AWS console to launch Jupyter
3. Use Jupyter during the workshop

The Sharer

This archetype is a user who owns data and wants to make it available. There are many mechanisms for sharing the data ranging from RESTful API of S3, to a SPARQL endpoint. Sample workflow:

1. Request a user account on the Open Data Lab
2. Load data into an S3 bucket
3. Configure one of the following
 - (a) SPARQL endpoint
 - (b) API Gateway to access S3
 - (c) S3 permissions for a SageMaker notebook
 - (d) ...

1.3 User Summary

group	projectID	# members	type
Bourne-Mura	bamc	4	MSDS Capstone
CBW	cbwc	4	MSDS Capstone
Wiki	wiki	9	MSDS Capstone
Mental Health	miip	6	SYS Capstone
Women Terror Recruitment	watr	2	Presidential Fellow
Healthy Markets	hmtt	5	DSI Research
Independent Study	pmis	1	DSI Research
Linked Open Data	nept	2	External Data
Spark	sprk	17	Education
GitHub	gith	9	Education
ORCI	orci	2	ODL Development
ML under	mlunder	7	Club
ML grad	mlgrad	3	Club
Rivanna	—	11	Local
Ivy	—	6	Local
ODL-education	—	26	Education Users
ODL-users	—	68	Unique Users

1.4 A phased approach

The first three phases of the Open Data Lab have been outlined. Phase 0 focused on pre investigation and decided on what technology to test in Phase 1, the closed beta. Phase 2 is an open Beta and will serve the community of Charlottesville and other associated research and educational efforts.

Phase	type	start	end
0	alpha	FEB 2018	JUN 2018
1	closed beta	JUL 2018	MAY 2019
2	open beta	TBD	-

Short Term Goals

1. Explore technology to solve open Open Data Lab questions
2. Serve Data Science Institute users
3. Understand user archetypes

Long Term Goal

Change the way science is done.

1.5 What's next for the Open Data Lab?

The year 2019 will be a big year for the Open Data Lab. The gathering of information and skill from the closed beta has gone well. While continuing the closed beta through the spring semester 2019 the Open Data Lab will be seeking to add staff to prepare for the open beta launch.

Chapter 2

Key Developments

- 2.1 Phase 1 - Closed β**
- 2.2 Establishment of User base**
- 2.3 Technology exploration**
 - 2.3.1 Amazon Web Services**
 - S3
 - EC2
 - SageMaker (Jupyter)
 - IAM
 - API Gateway
 - Architecture Diagrams
 - lambda
 - 13 TB Data Transfer
 - Usage Report
 - Support Plan
 - <https://aws.amazon.com/premiumsupport/compare-plans/>

2.3.2 Local UVA - Rivanna and Ivy

2.3.3 Github

2.3.4 Dataverse

2.3.5 Spark

2.3.6 SPARQL Endpoint

Chapter 3

Datasets

3.1 Healthy Markets

3.2 Numismatic

Chapter 4

Research

4.1 Bourne/Mura Capstone

4.2 DSI Wiki

Chapter 5

Education

A key component of openness is making resources usable. This idea falls in line with the idea that openness and accessibility are part of the same mission. As a result the educational component of the Open Data Lab is vital to the success of the project. There are two main thrusts in this endeavor. The first, which was piloted in 2018, is the production of educational materials and methods. The second part is the development of communication paradigms. This year two workshops were produced and delivered as part of the closed beta test. The first focused on the scale data protocol spark and the second the version control tool GitHub.

5.1 Spark Workshop

This workshop was designed as an introduction to spark. The goals were:

- Teach how to get started
- Build comfort
- Teach how to get answers to further questions

The topics covered included linking to a spark context, reading in data via dataframes, manipulating the data, and making a fundamental calculation. To power the workshop the attendees were given credentials on a Amazon SageMaker notebook. One of the features of this approach is that the whole workshop has access to the same environment. Everyone sees the same implementation of the software and hardware. There is no cumbersome overhead

in getting set up. The requirements are a web browser and access to the internet. Furthermore the single notebook environment leads to a very useful pedagogical capability. When a student encounters an error in their code the instructor can load their notebook on the main display in the room. In real time and in full view of everyone the instructor can debug and teach the whole class. This is a vast improvement over the current popular method of hovering over a single learners station. It enables every person in the room to see what is going on and maintain their level of engagement. This experience was very positive for the learners and the feedback to this approach was superlative. Previous versions of spark training was done with Databricks resources and there were several drawbacks precipitating the switch to Amazon.

- The environment is not shared between the workshop participants and the instructor
- Every learner independently established their own cluster and there is substantial lag
- Materials must be imported in Databricks format (.dbc) instead of more universal jupyter notebook format (.ipynb).

Resources:

- Databricks based workshop can be found at: <https://github.com/alonzi/spark>
- Amazon Sagemaker based workshop can be found at: <https://github.com/alonzi/spark-intro>
- Next generation materials will be incorporated into the Open Data Lab repository at: <https://github.com/UVA-DSI/Open-Data-Lab/tree/master/education>

The cost to operate and instructional environment is \$0.0464 per hour. For this workshop we ran the environment for one week at a cost of approximately \$10.

5.2 GitHub Workshop

The Open Data Lab was invited to present GitHub to the Archaeology Department of the Thomas Jefferson Foundation (aka Monticello). We developed a workshop to explain the fundamentals of version control and present

a work-flow for beginning users. The different user archetypes were also discussed. One of the major burdens to version control use is that it comes from the computer superuser community. Most of the software is developed using a terminal based interface (CLI). However in today's research world many one computer superusers interact with code and other materials that benefit from a version control workflow. The major benefit from GitHub is the browser based interface. This implementation shifts substantial pieces of cognitive load off the user. This shift enables the user to focus on developing their work rather than on the bookkeeping of version controlling their work. At the same time it makes it easy for the developers to take advantage of the version control benefits. There is substantial room to further develop materials for different user archetypes. This workshop focused on a research group. We will strive to identify other archetypes and develop materials to suit those needs. This workshop was taught straight from the GitHub repository itself. That was a natural fit given the subject matter. But it also demonstrated several very useful pieces of GitHub as a teaching medium, which will be discussed in 5.3.

Resources: <https://github.com/UVA-DSI/Open-Data-Lab/tree/master/education/GitHub>

5.3 Using GitHub as a Teaching Medium

Both of the workshops taught under the Open Data Lab project used GitHub as the repository for materials. This has several benefits.

- GitHub provides a URL and free hosting for resources
- Subsequent changes to the materials are stored under version control thus allowing the actual materials presented to be recovered
- Any learner who wants to suggest improvements to materials can implement a pull request

The decision to put the materials in GitHub was one of necessity since the Open Data Lab GitHub page serves as the repository for all Open Data Lab resources. GitHub by default provides a URL for every item stored in the repository and presents the README file of a repo. This presentation is automatically rendered from markdown. Wikipedia has demonstrated the success of using markdown for content presentation but to enumerate some

key features here. The document is organized, hyperlinkable, figures are easily embeded, and it seamlessly renders text alongside code and mathematical formulae.

5.4 Plans for 2019

The Open Data Lab is scheduled to teach several workshops in 2019:

- A five part series on Spark for the DSI MSDS cohort
- A three part series for the UVA Library on Python and Machine Learning
- Likely another three part series for the UVA Library in Fall 2019
potential collab with COS?

Chapter 6

Vital Metrics

6.1 AWS usage

6.2 FTE analysis

6.3 Budget

6.3.1 Funding

funded by the Data Science Institute healthy markets project funded off-budget for ODL